

*ARENE BOUCHETI*, A NEW INTERTIDAL LIOTIINE TURBINID  
(MOLLUSCA: GASTROPODA: TROCHOIDEA) FROM  
TRINDADE ISLAND, SOUTH ATLANTIC OCEAN

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*Abstract.*—The turbinid *Arene boucheti*, new species, is described from the rocky intertidal of the oceanic Trindade Island, located 1100 km off the Brazilian coast. Shell, opercular and radular characters allocate *A. boucheti* in the subfamily Liotiinae. The endemic species is characterized by a depressed, small but heavy shell with nodulose sculpture, coloration of grayish-green radial flamules and thick, strongly prosocline aperture.

*Resumo.*—O turbinideo *Arene boucheti* sp. n. é descrito. A nova espécie é proveniente do mesolitoral rochoso da Ilha da Trindade, situada a 1100 km ao largo da costa brasileira. Caracteres da concha, opérculo e rádula indicam que *A. boucheti* pertence à subfamília Liotiinae. A espécie endêmica é caracterizada por uma concha deprimida, pequena e sólida, com escultura nodulosa, coloração de faixas radiais verde-acinzentadas, com abertura espessa, marcadamente prosoclínea.

During the cruise MD55 made in May 1987 by the French research ship *Marion-Dufresne*, an undescribed turbinid was collected alive underneath volcanic boulders in the rocky shore of southeastern Trindade Island. In a similar fashion to several eastern Pacific liotiines (McLean 1970a, 1970b, 1971), but unlike species from the western Atlantic (Abbott 1974, Leal & Coelho 1985, McLean et al. 1988, Rios 1985), individuals of the new species live in the intertidal zone.

A distance of 1100 km separates Trindade Island from the nearest continental mass, the coast of eastern Brazil (Fig. 1). Trindade and the tiny islets of the Martin Vaz Archipelago, 50 km to the east, are the emerged and most recent expressions of a tectonic hotspot (Morgan 1983). Because of the relative ease in detecting the species due to aggregation of individuals in the rocky intertidal habitat, it is evident that the species is absent from the Brazilian coast, and endemic from Trindade. The species was not collected in a large number of sublittoral

stations made in Trindade, Martin Vaz, and on top of the submerged seamounts of the Vitória-Trindade Seamount Chain during the cruise MD55 (Leal & Bouchet 1991). Specimens examined are deposited in the following institutions: Los Angeles County Museum of Natural History (LACM); Museu de Zoologia, Universidade de São Paulo (MZUSP); Museu Oceanográfico de Rio Grande (MORG); Muséum national d'histoire Naturelle, Paris (MNHN).

Family Turbinidae Rafinesque, 1815  
Subfamily Liotiinae H. & A. Adams, 1854

Genus *Arene* H. & A. Adams, 1854

*Arene boucheti*, new species

Figs. 2–12, 15–17

*Description.*—Shell depressed-turbinate, thick-walled, small for genus, reaching 3.6 mm height and 3.9 mm width, opaque-white with radiating grayish-green flamules, 8 flamules in final whorl (Figs. 2–7). Intensity of color flamules vary in different specimens. Periostracum undetectable. Protoconch



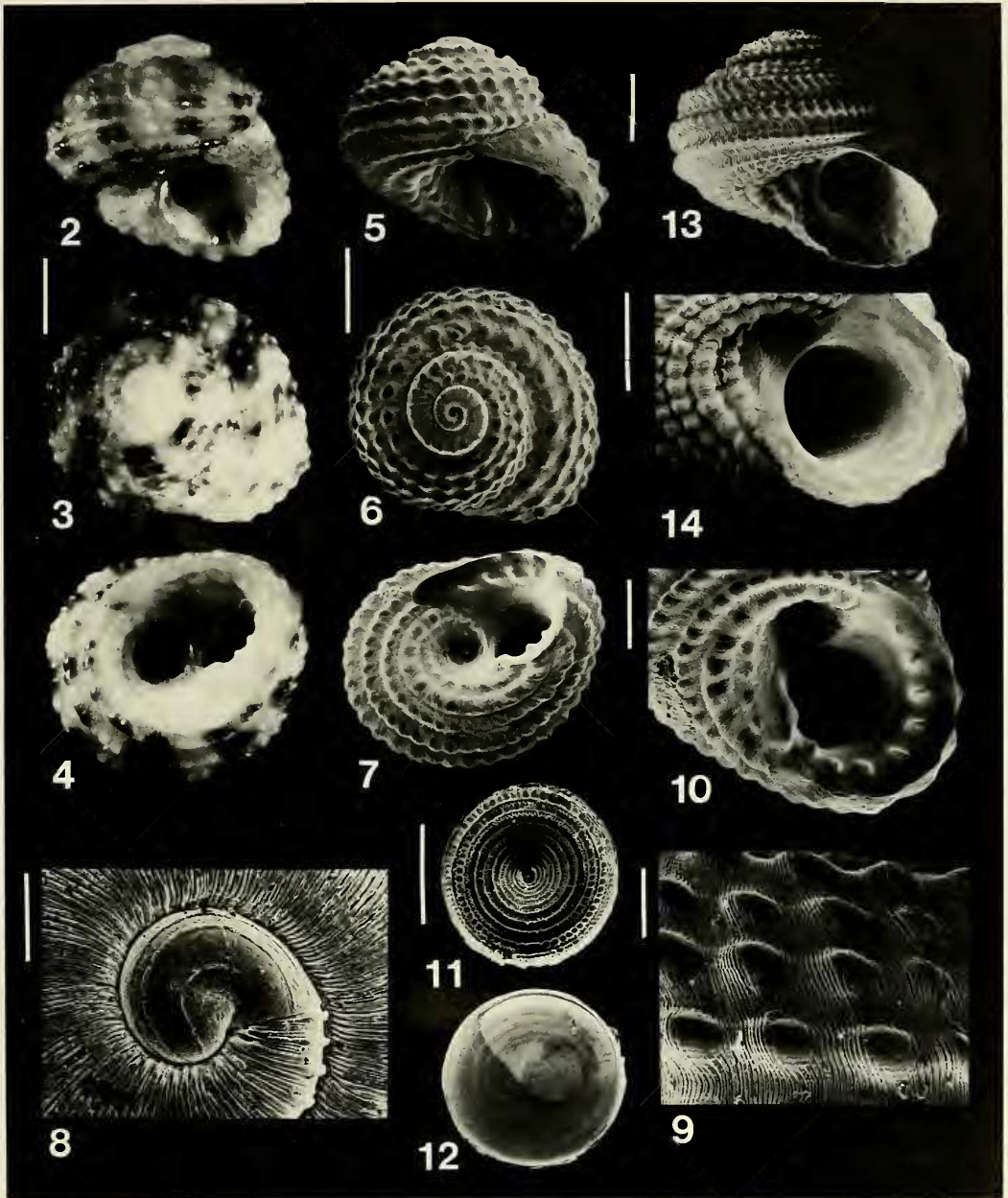
Fig. 1. Location of Trindade Island in the south Atlantic Ocean and of the type locality of *Arene boucheti* new species in Trindade Island (arrow).

white, 1.5 whorls, 0.25 mm diameter (Fig. 8). Apical surface of protoconch sculptured with 3 fine, well-defined spiral threads. Transition protoconch/teleoconch slightly flared. Teleoconch with 3.25 whorls. Spiral sculpture of five nodulose cords present only after 1.5 teleoconch whorls, 24–32 nodules/cord in final whorl. Adapical cord in each whorl slightly broader than others. Abapical cord in final whorl delimits both periphery and base. Axial sculpture of fine lamellae present over entire teleoconch surface (Fig. 9). Approximately 60 axial lamellae/mm in final whorl. Suture channeled. Base with 4 nodulose spiral cords, third cord wider than other 3, fourth and most abapical cord bordering the umbilicus (Figs. 7, 10). Umbilicus well-defined, deep. Aperture circular, strongly prosocline, thick, with 9 rounded denticles on outer lip, adapical extremity of external lip projecting over base (Fig. 10). Operculum circular, reaching 2.0 mm diameter, multispiral (Figs. 11, 12). Outer surface concave with central depression and about 12 spiral rows of calcareous nodules.

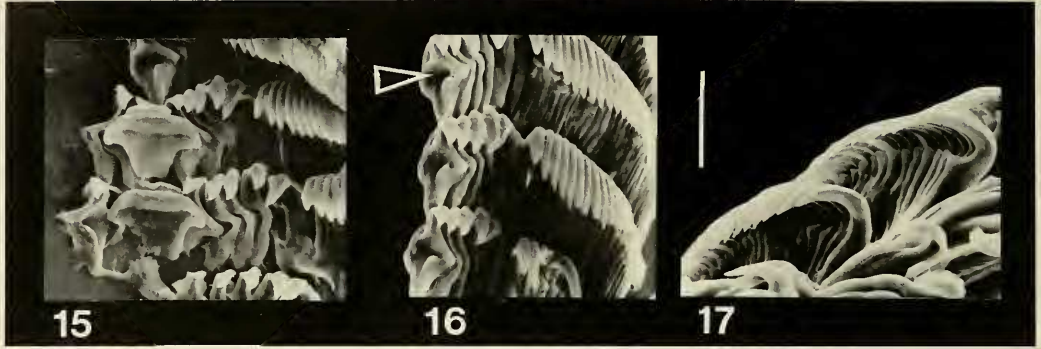
Inner surface convex, chitinous. Opercular attachment scar large, situated abaxially.

*Radula*.—Rhipidoglossate, formula  $\infty + 5 + 1 + 5 + \infty$ . Rachidian tooth broad, cusplless, with wide cutting edge. Lateral teeth single-cusped, external edges serrate (Figs. 15, 16). Lateral expansions of rachidian tooth interlock in ball-and-socket fashion with depressions in inner base of first lateral teeth (Fig. 16, arrow). Depression in inner base of each lateral tooth forms projection in its outer base. Projection interlocks with corresponding depression in next lateral tooth. Process is repeated in all lateral teeth. Marginal teeth with single, sickle-like cusps (Fig. 17). Cusps prominent and strongly hooked in inner marginal teeth, becoming externally serrated and progressively finer in outer marginal teeth. Single secondary cusps present internally on inner marginals.

*Etymology*.—Named after my colleague Philippe Bouchet of the Muséum national d'Histoire Naturelle, Paris, France, who first noticed this species in Trindade Island.



Figs. 2–14. 2–4: *Arene boucheti* new species, holotype: 2, Apertural view; 3, Apical view; 4, Umbilical view. Scale bar equals 1 mm. 5–12: *Arene boucheti* new species, SEM micrographs of paratype 1: 5, Apertural view; 6, Apical view; 7, Umbilical view. Scale bar equals 1 mm; 8, protoconch. Scale bar equals 0.1 mm; 9, Detail of shell surface at final whorl. Scale bar equals 0.2 mm; 10, Detail of aperture and umbilicus; 11, External surface of operculum; 12, Internal surface of operculum with attachment scar. (Note that Fig. 5 shows slight SEM distortion—shell is more depressed when compared to the photomicrograph in Fig. 2). Scale bars (10–12) equal 0.5 mm. 13, 14: *Arene guttata* McLean, 1970, SEM micrographs, Isla Santa Cruz, Galápagos Islands: 13, Apertural view; 14, Detail of aperture and umbilicus. Scale bars equal 1 mm.



Figs. 15–17. *Arene boucheti* new species, SEM micrographs of radula: 15, Half rows showing rachidian and lateral teeth; 16, Half rows showing sockets in first lateral teeth (arrow) where projection of rachidian teeth interlock; 17, Marginal teeth. Scale bar equals 0.02 mm.

*Type locality.*—Southeastern coast of Trindade Island, between Ponta das Tartarugas and Ponta do Túnel, 20°31'S, 29°18'W, in tide pool (see Fig. 1 [arrow], and Diretoria de Hidrografia e Navegação [1985] for details).

*Holotype.*—MZUSP 27816, 3.44 mm height, 3.75 mm width, live-collected at type locality, under boulders of volcanic rock during low tide, P. Bouchet and J. H. Leal, 22 May 1987.

*Paratypes.*—MORG 25621, 1 shell; MNHN, 5 live-collected specimens; all from type locality. For shell measurements see Table 1.

*Remarks.*—The new species is very distinctive in shell morphology from the type species of *Arene* (*Turbo cruentatus* Mühlfeld, 1829), which is large-shelled, with a stellate periphery. It is closer in profile to

the western Atlantic *Marevalvata* Olsson & Harbison, 1953, but lacks the flat base of the type species (*Architectonica tricarinata* Stearns, 1872) (see descriptions in Olsson & Harbison 1953). The generic allocation of *A. boucheti* tentatively follows the broad sense used by previous workers for this genus (Olsson & Harbison 1953; McLean 1970a, 1970b, 1971).

Marked radular similarities and resemblance in shell morphology suggested comparison of the new species to the liotiine genus *Cinysca* Kilburn, 1970 (see Barnard 1963, Kilburn 1970). *Cinysca*, however, is restricted to southern Africa, and differs from all other liotiines by having sexually dimorphic shells—females have larger umbilical cavities where they brood the larvae (J. H. McLean, in litt.).

Radular similarities are not restricted to *Arene*, s.l., and *Cinysca*. The similarity of radulae of liotiines and homalopomatines has been mentioned by McLean (1987) and is thoroughly discussed in the suprageneric arrangement proposed by Hickman & McLean (1990) for the Trochoidea. Hickman (1984) provided SEM micrographs of homalopomatine radulae quite similar to that in *A. boucheti*, and observed that, in radular rows of *Homalopoma carpenteri* (Pilsbry 1888), “basal interactions involve both overlap and interlock,” very much like what occurs in the new species. The same pattern

Table 1.—Shell measurements of holotype and 6 paratypes of *Arene boucheti* new species. Measurements in mm.

Character	Range	Mean	SD
Height	3.00–3.56	3.20	0.21
Width	3.34–3.88	3.60	0.20
Height final whorl	1.44–2.19	1.81	0.24
Aperture diameter	1.63–1.94	1.76	0.11
Protoconch diameter	0.23–0.29	0.25	0.02
Nodules/cord final whorl	24–32	27.4	2.6

is found at least in another trochacean family: Marshall (1988) gave SEM micrographs of the radula in the original description of the deep-sea skeneid *Dillwynella lignicola* Marshall, 1988. A broad rachidian tooth is present, wider in the middle section; lateral teeth have interlocked bases, and the marginal teeth are elongate, sickle-shaped.

*Arene boucheti* is related in general shell morphology to *A. guttata* McLean, 1970 from the Galápagos Islands (Figs. 13, 14) (LACM 145166, 5 shells, Isla Santa Cruz [Indefatigable], Galápagos, J. de Roy leg.). However, *A. boucheti* differs from this latter species by its smaller size (*A. guttata* can reach 5.0 mm width), by a much thicker and heavier shell, a coloration pattern of radiating grayish-green flamules instead of the random dotting of pink present in *A. guttata*. The spiral sculpture in *A. boucheti* consists of cords with rounded nodules; beading on the cords of *A. guttata* results from the overlapping of 5 to 8 layers of prosocline lamellae. There are 24–32 nodules on the final whorl in *A. boucheti*, and about 45 in *A. guttata*. The aperture in *A. boucheti* is characterized by a deep embayment in the columellar region and parietal wall. This embayment extends to the umbilicus. The aperture is holostomatous in *A. guttata*, without indentation. Strong teeth are present inside the outer lip in *A. boucheti*, while only faint denticles are found in *A. guttata*.

Other species probably related to *A. boucheti* and *A. lurida* (Dall 1913), from the coast of Baja California, Mexico, and '*Cinysca*' *pacifica* Ladd, 1966, from the Miocene of Eniwetok Atoll. '*Cinysca*' *pacifica* is known to me only from the illustration in the original description (Ladd 1966). A comparison of the type series of *A. boucheti* with shells of *A. lurida* (LACM 66-28.2, 20 shells, Bahia Partida [between Islas Partida and Espíritu Santo], Gulf Coast, Baja California Sur, Mexico [24°31'N, 110°23'W], coll. McLean, Oringer and Marincovich, 10 Apr 1966) shows that the latter species has

more angulose whorl profiles, dark red color, and more delicate, less distinctive nodules in the shell surface.

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